

Clean Version of Entire Set of Pending Claims
Pursuant to 37 C.F.R. 1.121(c)(3)

1. A raking device for breaking up a surface, said raking device comprising:

a plurality of rakes mounted on a rake frame and arranged to produce an upwardly directed resultant force in response to a horizontally directed force arising from encountering an obstruction in a path of travel of said raking device;

a rake frame support mounting said rake frame to a rake frame carrier structure and allowing controlled movement of said rakes in a vertical direction;

a force applicator acting between said rake frame carrier structure and said rake frame support for applying at least a downward force to said plurality of rakes, said force applicator being responsive to an increase in said upwardly directed resultant force above a preset amount to allow said plurality of rakes to move upwardly in response to said increase.

2. A raking device for breaking up a surface, said raking device comprising:

a plurality of rakes mounted on a rake frame and arranged to produce an upwardly directed resultant force in response to a horizontally directed force arising from encountering an obstruction in a path of said raking device;

a rake frame support mounting said rake frame to a rake frame carrier structure and allowing controlled movement of said rakes in a vertical direction;

a force applicator acting between said rake frame carrier structure and said rake frame support for applying at least a downward force to said plurality of rakes, said force applicator being responsive to an increase in said upwardly directed resultant force above a preset amount to allow said plurality of rakes to move upwardly in response to said increase;

said rake frame support including at least one linkage member pivotally connected to said rake frame and to said rake frame carrier;

said force applicator including a fluid pressure responsive piston slidably received within a bore and connected to said linkage member to apply said downward force in response to fluid pressure within said bore;

each said rake including a downwardly depending spring secured at a frame end to said rake frame and a rake tip secured to said rake spring at tip end of said rake spring distal said frame end; and,

wherein said frame end leads said tip when said rake is in an operative position.

3. A raking device as claimed in claim 2 further comprising:

a fluid pressure supply system fluidly communicating with said bore through a first fluid conduit for supplying said pressurized fluid at a predetermined pressure and flow rate to said bore to act on a first face of said piston to cause said piston to exert said downward force;

said fluid pressure supply system including a fluid pressure bleed passage through which a portion of said pressurized fluid being supplied through said first fluid conduit to said bore is continually bled off at a volume flow rate determined by the pressure of said pressurized fluids, said fluid pressure bleed passage allowing an increase in said volume flow rate therethrough in response to an increase in pressure as would be occasioned by said piston being responding to an increase in said resultant force exerted by said rakes to enable said rakes to move upwardly in response to an increase in said horizontally directed force.

4. A raking device as claimed in claim 3 wherein:

said fluid pressure supply system includes a fluid reservoir, a fluid pump and a pressure reducing valve;

said fluid pump has an inlet in fluid communication with said fluid reservoir for receiving fluid from said fluid reservoir;

said fluid pump has an outlet for supplying pressurized fluid to said fluid pressure supply system;

said pressure reducing valve is interspersed between said pump and said first fluid conduit to control fluid pressure in said first fluid conduit;

said bleed passage has a flow restrictive orifice therein; and,

said bleed passage discharges bled off fluid into said fluid reservoir.

5. A raking device as claimed in claim 4 wherein:

said fluid pressure supply system includes a second fluid conduit for supplying pressurized fluid to a second face of said piston opposite said first face, to cause said piston to exert an opposite force on said linkage member to move said rakes upwardly and a control valve to selectively direct said pressurized fluid between said first and second conduits.

6. A raking device as claimed in claim 5 wherein:

said pressure reducing valve includes a free flow bypass; and,

said control valve is a three position four way closed center valve.

7. A raking device as claimed in claim 6 wherein:

said fluid is hydraulic oil.

8. A raking device as claimed in claim 2 having a plurality of said rake frames and wherein said rake frames are pivotally mounted to allow rocking of said rake frame about a horizontal axis generally parallel to said path of travel.

9. A raking device as claimed in claim 8 wherein:

said rake frame is pivotable about said axis to a position of about 10 degrees from the horizontal to either side.

10. A raking device as claimed in claim 9 wherein:

said rake frame support is a parallel bar linkage including at least two laterally extending generally parallel bars pivotably connected, one above the other, to said rake frame at one end and to said rake frame carrier at an opposite end.

11. A raking device as claimed in claim 9 wherein:

said linkage member is a bell crank having a first end pivotably connected to said rake frame, a second end opposite said first end pivotably connected to said force applicator, said bell crank being pivotably connected between said first and second ends to said rake frame carrier.

12. A raking device as claimed in claim 4 having a plurality of said rake frames and wherein said rake frames are pivotally mounted to allow rocking of said rake frame about a horizontal axis generally parallel to said path of travel.

13. A raking device as claimed in claim 12 wherein:

said rake frame is pivotable about said axis to a position of about 10 degrees from the horizontal to either side.

14. A raking device as claimed in claim 13 wherein:

said rake frame support is a parallel bar linkage having at least two laterally extending generally parallel bars pivotably connected, one above the other, to said rake frame at one end and to said rake frame carrier at an opposite end.

15. A raking device as claimed in claim 14 wherein:

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said linkage member is a bell crank having a first end pivotably connected to said rake frame, a second end opposite said first end pivotably connected to said force applicator, said bell crank being pivotably connected between said first and second ends to said rake frame carrier.

16. A raking device as claimed in claim 7 having a plurality of said rake frames and wherein said rake frames are pivotally mounted to allow rocking of said rake frame about a horizontal axis generally parallel to said path of travel.

17. A raking device as claimed in claim 16 wherein:

said rake frame is pivotable about said axis to a position of about 10 degrees from the horizontal to either side.

18. A raking device as claimed in claim 17 wherein:

said rake frame support is a parallel bar linkage including at least two laterally extending generally parallel bars pivotably connected, one above the other, to said rake frame at one end and to said rake frame carrier at an opposite end.

19. A raking device as claimed in claim 18 wherein:

said linkage member is a bell crank having a first end pivotably connected to said rake frame, a second end opposite said first end pivotably connected to said force applicator, said bell crank being pivotably connected between said first and second ends to said rake frame carrier.